

Claims

1. An automatic system (10) for taking of a fluid sample from a sample site (SS) of a living test object, comprising:
  - 5 - catheter means (C<sub>A</sub>, C<sub>B</sub>) comprising a three-way junction (C<sub>J</sub>) configured to be located in proximity to said sample site (SS), said three-way junction (C<sub>J</sub>) is connected to a first catheter means (C<sub>A</sub>), a second catheter means (C<sub>B</sub>) and a sample-taking end (C<sub>TE</sub>);
    - a valve (V<sub>A2</sub>) connected to said first catheter means (C<sub>A</sub>), said valve (V<sub>A2</sub>) having an inlet (V<sub>I</sub>) for an immiscible fluid to be aspirated into said first catheter means (C<sub>A</sub>); and
  - 10 - pumping means (P<sub>A</sub>, P<sub>B</sub>) connectable to said catheter means (C<sub>A</sub>, C<sub>B</sub>) and configured to aspirate an amount of said immiscible fluid (AB) into said first catheter means (C<sub>A</sub>) and to move said amount of said immiscible fluid (AB) to said three-way junction (C<sub>J</sub>) and arrange a first part (AB<sub>1</sub>) of said immiscible fluid (AB) in a part of said second catheter means (C<sub>B</sub>) and a second part (AB<sub>2</sub>) of said immiscible fluid in a part of said first catheter
  - 15 means (C<sub>A</sub>); whereby said first (AB<sub>1</sub>) and second (AB<sub>2</sub>) parts of said immiscible fluid (AB) being configured to separate a taken sample (TS) from the rinsing fluid.
2. The system as recited in claim 1, wherein said pumping means (P<sub>A</sub>, P<sub>B</sub>) further being configured to control the flow rate and the flow direction of a fluid comprised in said
- 20 catheter means (C<sub>A</sub>, C<sub>B</sub>) such that said fluid flow can pass by said sample-taking end (C<sub>TE</sub>) when flowing from one of the first and second catheter means (C<sub>A</sub>, C<sub>B</sub>) to the other.
3. The system as recited in claim 1 or 2, wherein said sample-taking end (C<sub>TE</sub>) is configured to be placed at said sample site (SS), wherein said pumping means (P<sub>A</sub>, P<sub>B</sub>)
- 25 being configured to move said first part (AB<sub>1</sub>) of said immiscible fluid (AB) towards an end opening of said sample-taking end (C<sub>TE</sub>) and to take a fluid sample when said first part (AB<sub>1</sub>) is located at the end opening, and wherein said pumping means (P<sub>A</sub>, P<sub>B</sub>) is configured to transport said taken sample (TS) from said sample-taking end (C<sub>TE</sub>) to a sample-delivery end (C<sub>DE</sub>) configured to deliver said taken sample (TS) to a sample tube
- 30 (T).
4. The system as recited in any of the preceding claims, further comprising a plurality of valves (V<sub>A1</sub>, V<sub>A2</sub>, V<sub>B1</sub>, V<sub>B2</sub>, V<sub>B3</sub>, V<sub>B4</sub>) arranged at said catheter means (C<sub>A</sub>, C<sub>B</sub>) and

configured to control the flow path of said fluid in said catheter means ( $C_A$ ,  $C_B$ ).

5. The system as recited in claim 4, further comprising a control unit (CU) connectable to said pumping means ( $P_A$ ,  $P_B$ ) and said plurality of valves ( $V_{A1}$ ,  $V_{A2}$ ,  $V_{B1}$ ,  $V_{B2}$ ,  $V_{B3}$ ,  $V_{B4}$ ) and configured to control the operation of said pumping means ( $P_A$ ,  $P_B$ ) and said plurality of valves ( $V_{A1}$ ,  $V_{A2}$ ,  $V_{B1}$ ,  $V_{B2}$ ,  $V_{B3}$ ,  $V_{B4}$ ).

6. The system as recited in any of the preceding claims, wherein said catheter means ( $C_A$ ,  $C_B$ ) comprises a double lumen catheter means..

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7. The system as recited in any of the preceding claims, further comprising a source of a rinsing fluid ( $F_A$ ,  $F_B$ ) connectable to said catheter means ( $C_A$ ,  $C_B$ ) and configured to supply a rinsing fluid from said source ( $F_A$ ,  $F_B$ ) to said catheter means ( $C_A$ ,  $C_B$ );

8. The system as recited in claim 7, wherein said pumping means ( $P_A$ ,  $P_B$ ) are configured to provide a flow of rinsing fluid from said source ( $F_A$ ,  $F_B$ ) of rinsing fluid through said catheter means ( $C_A$ ,  $C_B$ ) to a waste tube at the delivery end ( $C_{DE}$ ) of said catheter means ( $C_B$ ).

9. The system as recited in claim 8, wherein the flow of rinsing fluid is accomplished by means of a first pumping means ( $P_A$ ) providing a pushing action equal to a suction action provided by a second pumping means ( $P_B$ ), whereby the rinsing fluid will pass by said sample-taking end (CE) without entering it when flowing from said first catheter means ( $C_A$ ) to said second catheter means ( $C_B$ ).

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10. The system as recited in claim 8, wherein the flow of rinsing fluid is accomplished by means of a first pumping means ( $P_A$ ) pushing with a slightly higher pressure than a second pumping means ( $P_B$ ) is sucking, whereby a part of the rinsing fluid enters and rinses said sample-taking end ( $C_{TE}$ ) of the catheter means ( $C_A$ ,  $C_B$ ).

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11. The system as recited in claim 10, wherein said sample-taking end ( $C_{TE}$ ) is rinsed by means of said first pumping means ( $P_A$ ) pushing at 100% of a flow  $F$  and said second pumping means ( $P_B$ ) sucking at 90% of said flow  $F$ .

12. The system as recited in any of the preceding claims, wherein said pumping means ( $P_A$ ,  $P_B$ ) is configured as one single double-acting suction and force pumping means with a first part ( $P_A$ ) having the capability of providing a pushing action and a second part ( $P_B$ ) having the capability of providing a suction action, or vice versa, and wherein said first and  
5 second parts ( $P_A$ ,  $P_B$ ) further being configured to operate simultaneously or separately.
13. The system as recited in claim 12, further comprising a third pumping means configured to operate when the first and second parts of said double-acting suction and force pumping means ( $P_A$ ,  $P_B$ ) are operated separately and to compensate for the action of  
10 the active one of said first ( $P_A$ ) and second parts ( $P_B$ ).
14. The system as recited in any of the preceding claims, further comprising analysing means (AM) configured to analyse said taken fluid sample (TS).
- 15 15. The system as recited in any of the preceding claims, further comprising a source of a drug solution connectable to said catheter means ( $C_A$ ,  $C_B$ ), said pumping means ( $P_A$ ,  $P_B$ ) being configured to transport an amount of said drug to said sample-taking end ( $C_{TE}$ ) and supply said a drug to said sample site (SS).
- 20 16. A method for automatic taking of a fluid sample from a sample site (SS) of a living test object, comprising the steps of:
- supplying a rinsing fluid to a catheter means ( $C_A$ ,  $C_B$ ) (step 100);
  - aspirating an amount of an immiscible fluid (AB) into the catheter means ( $C_A$ ,  $C_B$ ) (step 102);
  - 25 - moving said amount of said immiscible fluid (AB) to a three-way junction ( $C_J$ ) of said catheter means ( $C_A$ ,  $C_B$ ) (step 104);
  - moving a first part ( $AB_1$ ) of said immiscible fluid (AB) towards an opening of a sample-taking end ( $C_{TE}$ ) (step 106);
  - withdrawing a fluid sample (TS) (step 108);
  - 30 - arranging a second part ( $AB_2$ ) of said immiscible fluid (AB) after said taken sample (TS) (step 110);
  - moving said taken sample (TS) in said catheter means ( $C_A$ ,  $C_B$ ) to a sample-delivery end ( $C_{DE}$ ) at a sample tube (T) (step 112);
  - delivering said taken sample (TS) to said sample tube (T) (step 114); and

- rinsing the lumens of said catheter means (C<sub>A</sub>, C<sub>B</sub>) by providing a flow of rinsing fluid through said catheter means (C<sub>A</sub>, C<sub>B</sub>) (step 116).

17. A computer program product for use in an automatic system for taking of a fluid  
5 sample from a sample site (SS) of a living test object said computer program product comprising computer code portions configured to realise means and functions of any of the preceding claims.
18. A set of disposables for use in an automatic system for taking of a fluid sample from a  
10 sample site (SS) of a living test object according to any of the claims 1 – 15.